

Daily GLOWBUGS

Digest: V1 #46

via AB4EL Web Digests @ SunSITE

Purpose: building and operating vacuum tube-based QRP rigs

[AB4EL Ham Radio Homepage @ SunSITE](#)

%%%% GlowBugs %%%% GlowBugs %%%% GlowBugs %%%% GlowBugs %%%%

Subject: glowbugs V1 #46

glowbugs

Friday, May 30 1997

Volume 01 : Number 046

Date: Thu, 29 May 1997 18:53:49 -0500 (CDT)

From: Dave <gekko95@ix.netcom.com>

Subject: Silly signature line...

To slow the tide of queries to me why my sig line says
what it said in my last post (AES Update)...

Part of an inside joke (eh, McAulay?) from another
email. Forgot to clear it outta there.

To those who emailed me about it, thar's yer answer, mate

:)

Dave

Note the conspicuous absence of a signature line

Date: Fri, 30 May 1997 02:02:56 +0000

From: "Brian Carling, Radio AF4K" <bry@mnsinc.com>

Subject: Re: Antique Electronic Supply

For information about AES, try:

<http://www.mnsinc.com/bry/hamlynx/hamdealr.htm>

On 29 May 97 at 7:31, Adam Liette spoke about Antique Electronic

```
> I know I could just call them and it would be faster, but
> does AES (Arizona) have a webpage and/or e-mail?
> Would be very helpful in finding their prices.
>
> TNX
> Adam Liette
> URL:kb8ydx.base.org
> E-Mail:kb8ydx@geocities.com
>
> -----
> / |
> / | ---| / |__|_|
> / |-----|_|_|
> ..._._
>
*****
*** 73 from Radio AF4K/G3XLQ Gaithersburg, MD USA *
** E-mail to: bry@mnsinc.com *
*** See the interesting ham radio resources at: *
** http://www.mnsinc.com/bry/ *
*****
```

I wasn't paying attention, 1 demerit tallied.
How scarce are these 12K5 etc?
- -bob

Got a question for the group that has probably already been addressed before, but here it is again. Was there an adapter ever made to convert FT-243 to HC-6 pin spacing? I got my rocks from Phoenix xtals and want to use them in my DX-60 as well as my DX-20. I'd like to know before hunting for one at the next hamfest. Or, if you know of any homebrew methods? Any enlightenment would be appreciated.

~~~~~  
R. Eric Sluder, KB9BGS  
3339 Eden Way  
Carmel, IN 46033-3070 USA

<><

~~~~~

Date: Fri, 30 May 1997 10:08:50 +0000
From: "Brian Carling, Radio AF4K" <bry@mnsinc.com>
Subject: Re: "Autotransformer modulation"

Somemore comments from Dave, G3UUR on this theme:

Going back to the autotransformer modulation, the problem with single-ended class 'A' modulators is the power dissipation required in the modulator tubes. For instance, to modulate 100W DC input to the PA you require 50W of audio and you can only get about 12W from each of four 807s running at 25W input in class 'A'. The peaks of modulation may just reach 100% if you're lucky. Five tubes in parallel in the modulator would be better as it would give some margin for transformer losses, etc. A push-pull class 'B' modulator with two 807s could give enough output for 100% modulating 150W input and the power consumption would be little more than that required for two 807s in class 'A' which could just about modulate a DC input of 50W. Push-pull class 'B' is a must for the higher power levels. The autotransformer trick is OK for rigs of up to about 25W DC input, but above that you pay in size and power for the economy of the modulation transformer. I like to use it for rigs like a single 6BW6 modulating a single 6BW6 at 10W DC input or an EL34 or 807 modulating a 2E26 or 807 running at 25W DC input. I have tried parallel class 'A' modulators, but they become big and very hot as you try to go for more and more RF power out. Using the existing amplifier into another output transformer reversed (secondary to primary) for the high impedance feed to the PA might be a way round your problem if you can find a transformer intended for a large enough DC component of current in the original primary, which becomes the secondary of the new arrangement and has the take the DC feed to the PA stage.

=====

BTW - I THIN K tht he means 6GW8 / ECL86 not 6BW8.

Bry

*** 73 from Radio AF4K/G3XLQ Gaithersburg, MD USA *
** E-mail to: bry@mnsinc.com *
*** See the interesting ham radio resources at: *
** <http://www.mnsinc.com/bry/> *

Date: Fri, 30 May 1997 11:06:54 -0400

From: Ray LaRue <raylarue@gte.net>
Subject: "autotransformer modulation"

Didn't keep the original post, but I think you are talking about "heising" modulation.

A brief discription is found in Bill Orr's "The Radio Handbook", 16th edition, p 292. It is described as "the oldest system of plate modulation. It usually consists of a class A audio amplifier, coupled to the RF amplifier, by means of a modulation choke coil". "It is sometimes known as "constant current" modulation. Because of the effective 1:1 ratio of the coupling choke, it is impossible to obtain 100 % modulation unless the plate voltage to the modulated stage is dropped slightly", by a resistor.

It's a technique used in the recent past by broadcast engineers, who have had a failure of the regular class B, modulation transformer. They have jury rigged a Heising system, while waiting for a new transformer.
73,
Ray, W4BYG

Date: Fri, 30 May 1997 10:00:44 -0600
From: mack@mails.imed.com (Ray Mack)
Subject: Re: FT243 to HC-6?

Eric:

I don't know of a conversion from FT-243 to HC-6. You can go the other way really easy. Just demolish any Octal plug (a defunct tube or a relay). Take 2 pins and solder them over the pins of the HC6. There are several tricks to get the pins not to wiggle.

As you can guess from above, the pin spacing for HC 6 and FT-243 is identical; the pins are just smaller on the HC6. What comes to mind is to take a defunct HC6 and unsolder the can. Demolish an octal socket and take 2 pins from the socket and solder them onto the header for the HC6. Presto chango! Again this may not be especially mechanically sound, but it should work.

Ray Mack
WD5IFS
mack@mails.imed.com
Friendswood (Houston), TX

Reply Separator

Subject: FT243 to HC-6?
Author: "R. Eric Sluder" <sludere@gte.net> at mails
Date: 5/30/97 9:07 AM

Got a question for the group that has probably already been addressed before, but here it is again. Was there an adapter ever made to convert FT-243 to HC-6 pin spacing? I got my rocks from Phoenix xtals and want to use them in my DX-60 as well as my DX-20. I'd like to know before hunting for one at the next hamfest. Or, if you know of any homebrew methods? Any enlightenment would be appreciated.

Date: Fri, 30 May 1997 09:29:12 -0600 (MDT)
From: Art Winterbauer <art@comet.ucar.edu>
Subject: Re: FT243 to HC-6?

I've taken an old FT-243 xtal holder and soldered "legs" to each pin. The legs were snapped from a paperclip. Then I plugged the converter with legs into the HC-6 holder on the rig, and the FT-243 xtal into the converter.

Sometimes, tho, the larger FT-243 xtal was too sluggish in the circuit intended for the HC-6.

- --Art wa5oes

Date: Fri, 30 May 1997 09:10:56 -0700 (MST)
From: Jeff Duntemann <jeff.duntemann@coriolis.com>
Subject: Re: space charge tubes scarce?

At 09:13 AM 5/30/97 +0100, BOB DUCKWORTH wrote:
>I wasn't paying attention, 1 demerit tallied.
>How scarce are these 12K5 etc?

Not scarce at all, judging either by their prices (often under \$2, even at AES) or by difficulty of finding them, which has always (for me at least) been nil. I keep thinking RCA must have made gazillions of them in the late fifties, never imagining that transistors would wipe out the empty state car radio almost completely by 1964 or so. AES has them, Alltronics has them, most other tube dealers have them--often VERY cheap and often on sale. What were they ever used in besides those ugly greasy AM car radios?

I find them in loose tube boxes at hamfests for a quarter. They're definitely out there. Their only real downside is that they're current hogs. The 12AL8 one-tube audio amp I have on the bench right now draws 900 mils cold, dropping to about 650 mils when the cathodes are up to temp. I could well imagine that a five tube superhet might draw three amps continuously--which is tough to get out of a wall wart, which was my original concept. (I run 12V things like this off gel cells.)

- --73--

- --Jeff Duntemann KG7JF
Scottsdale, Arizona

Date: Fri, 30 May 1997 11:22:06 -0500 (CDT)
From: mjsilva@ix.netcom.com (michael silva)
Subject: Using switching PS to get B+ from 12v -- ideas?

Hi all,

73,
Mike, KK6GM

The diagram illustrates a sequence of graphs $G_1, G_2, G_3, \dots, G_n$. Each graph is represented by a set of vertices (dots) and edges (lines). G_1 is a simple path of three vertices. G_2 is a path of three vertices with an additional vertex connected to the middle vertex. G_3 is a path of three vertices with two additional vertices connected to the middle vertex. The sequence is labeled $G_1, G_2, G_3, \dots, G_n$.

Try any hour on the hour on either QRG anytime after dark.

The usual CQ BA call will suffice, with 0300Z reserved for the QRQ CWists on 7050.

Hope to see some of you there.....

73/ZUT DE NA4G/Bob UP

Date: Fri, 30 May 1997 14:15:40 +0100

From: BOB DUCKWORTH <bob@atl.org>

Subject: Re: Using switching PS to get B+ from 12v -- ideas?

Junkbox swap time!

I've about a dozen Triad inverter transformers.

Complete with apps sheet or look in 67 handbook

at the mobile transceiver construction article.

600VDC and 300VDC (centertapped secondary) at 120mil total.

Two transistors, some diodes and caps, two bias resistors

and your set.

Don't know about switching other than it's like an

inverter with an autotransformer and some feedback

to vary pulse width as needed to maintain power at

voltage or current set point.

- bob

michael silva wrote:

>

> Hi all,

>

> I'm very interested in putting together a (semi) portable rig (current

> plans are three 5EA8s (sic) for receiver, 6EA8 and 6AQ5 for

> transmitter), and I'm thinking about how to get 300 or so volts out of

> a car battery. I know the old way to do it, but does anybody know

> enough about switching regulators to comment on the difficulty of doing

> it that way? Any parts or manufacturers recommendations?

>

> 73,

> Mike, KK6GM

Date: Fri, 30 May 1997 13:38:36 -0500 (CDT)

From: Bob Roehrig <broehrig@admin.aurora.edu>

Subject: Re: Using switching PS to get B+ from 12v -- ideas?

On Fri, 30 May 1997, michael silva wrote:

> I'm very interested in putting together a (semi) portable rig (current

> plans are three 5EA8s (sic) for receiver, 6EA8 and 6AQ5 for

> transmitter), and I'm thinking about how to get 300 or so volts out of

> a car battery. I know the old way to do it, but does anybody know

> enough about switching regulators to comment on the difficulty of doing

> it that way? Any parts or manufacturers recommendations?

Look in some of the older ARRL handbooks. ARRL also had a "Mobile Handbook" at one time too. You should find designs for transistorized DC/DC converters. Most just use a pair of power transistors and a torroidal transformer. It's kind of a replacement for the vibrator supply. Triad made transformers specifically for this job. I built one to replace the dynamotor in my old trunk mounted Motorola 80-D rig.

E-mail broehrig@admin.aurora.edu 73 de Bob, K9EUI
CIS: Data / Telecom Aurora University, Aurora, IL
630-844-4898 Fax 630-844-5530

Date: Fri, 30 May 1997 14:47:51 -0500
From: John Michael <MICHAEL@ecs.umass.edu>
Subject: Re: Can I do anything with these?

>I have the following tubes. Can I use any in a transmitter?

>6BH6
>6U8A
>12AU7A
>6CL6
>12AT7/ECC81
>12AX7

You can't really do much with these as PA tubes, I'm afraid Adam. The 6CL6 with a plate dissipation of around 7 watts is the heftiest of the bunch. Of course anything you can get to oscillate can be used as an output tube if you don't care how far you go. Anyone here used the 6CL6 in an exciter stage? The 12AT/AU/AX tubes are all twin triodes, of various Gm. You could use them in a mike preamp stage in a transmitter.

Best wishes,

John Michael michael@ecs.umass.edu

Date: Fri, 30 May 1997 14:10:20 -0500 (CDT)
From: mjsilva@ix.netcom.com (michael silva)
Subject: B+ from 12v -- torroid sources?

Yes, I do remember seeing articles about torroids used in inverters. Even have a vague memory of an article on wrapping the core with glass cloth and baking it in an oven...

So, where would a person look for such a torroid (wound or unwound)?

73,
Mike, KK6GM

Date: Fri, 30 May 1997 15:43:48 -0500
From: Conard Murray <ws4s@InfoAve.Net>

Subject: BA swaplist info

From: Eugene Rippen <soundval@foothill.net>

To: baswaplist@foothill.net

Cc: soundval@foothill.net

Date: Friday, May 30, 1997 1:55 PM

Subject: 400 Subscribers & Thanks

>THANKS to brian Carling of HEATH@listserv.temp.gov
>and thTHANKS to the Administrator of rec.radio.swap
>who this week both posted notices of this baswaplist
>reflector: baswaplist has about 70 new subscribers.
>
>As of this time there are now 400 SUBSCRIBERS
>
>For our most recent new ones the Welcom message follows:
>This is a mailing to subscribers to the list of BA buyers and
>sellers.
>
>THE LIST NAME IS: baswaplist
>It is located at: baswaplist@foothill.net
>
>This is a reflector:
> baswaplist@foothill.net.
>
>To subscribe send email TO: majordomo@foothill.net
> and in the message ONLY say: subscribe baswaplist
>
>To unsubscribe send email TO: majordomo@foothill.net
> and in the message ONLY say: unsubscribe baswaplist
>
>To send a post to the members of the list:
> send email TO: baswaplist@foothill.net
>
>To get a copy of the posting sent back to yourself you must
> CC it to yourself.
>
>For ANY administrative matters, complaints, etc please
> address them to me:
> TO: soundval@foothill.net
>
>THE RULES
>
> 1. Obviously all communications regarding administration
>should be direct to me, soundval@foothill.net. Never to baswaplist.
> 2. The list is for posting of items for sale, want to buys, and
>want to trades. It is for tube type equipment and their contemporary
>accessories and parts. Any equipment with tubes is welcome.
> 3. I will not have a stroke over a few solid state items but
>remember that the members of the list are chosen as BA people.
>Solid state test equipment and accessories that are appropriate
>for this list are welcome; however, please use your descretion.
> 4. For now, no individual email postings over 3 pages.
> 5. Please watch the line lengths - - No more than 70 characters
>long generally is readable on most software. Some have suggested 67.
> 6. Please limit auctions. Listing items with no prices, is an
>auction. The purpose of this list is not to guarantee top prices to
sellers.

>To have some items left open for offers is OK. To have an entire list of
>items with no prices is merely an auction. To say that it is the estate
sale
>for the survivor, is not an excuse, unless the request is for one bid for
>the entire estate.
>
>I am open for any and all suggestions as to these rules. Feel safe. You

>cannot insult me.
>
>Understand this list is only for buying, selling. and trading.
>And, for subject matters related to such.
>It appears that discussions of the values of SPECIFIC items, and of
packing
>and shipping are appropriate.
>Please, let us not get into metaphysical discussions of pricing morals
and
>standards.
>
>I will listen to your Emails to me concerning any unfair practices.
>
>This list is not to be used as a consignment agent or a substitute for
"floor
>planning", in other words don't even think about stalling on a purchase
>while looking for someone to re-sell the item to.
>
>Roland Geter is not welcome.
>
>It is up to those on the list to keep the list informed of Email addresses

>that actually work.
>
>So far, there is no digest set up. It is being worked on.
>To temporarily suspend subscription, please unsubscribe and then
subscribe
>again; all as stated above.
>
>Please use Email, rather than phoning me.
>
>Gene
>

Date: Fri, 30 May 1997 13:48:49 -0700 (PDT)
From: Ken Gordon <keng@uidaho.edu>
Subject: Re: FT243 to HC-6?

> Got a question for the group that has probably already been addressed
> before, but here it is again. Was there an adapter ever made to convert
> FT-243 to HC-6 pin spacing? I got my rocks from Phoenix xtals and want
> to use them in my DX-60 as well as my DX-20. I'd like to know before
> hunting for one at the next hamfest. Or, if you know of any homebrew
> methods? Any enlightenment would be appreciated.

Carefully cut the pins off an old octal socket and push them over the HC-6
pins. Viola! Perfect fit.

Ken W7EKB

Date: Fri, 30 May 1997 17:30:04 -0400
From: Adam Liette <kb8ydx@geocities.com>
Subject: QRP Transmitter

Hello again. I found a 6AQ5A I might use for a transmitter. Got a schematic from W4FK's sight (TNX Bry). If I can find all the stuff to put it together, think I'll try it.

Someone said something abt an xmtr with a 6L6 and a 6U8.
Anyone have the schematic somewhere?

TNX ES 73

Adam Liette
URL:kb8ydx.base.org
E-Mail:kb8ydx@geocities.com

[illegible]

Date: Fri, 30 May 1997 16:45:32 -0600
From: mack@mails.imed.com (Ray Mack)
Subject: Re: Using switching PS to get B+ from 12v -- ideas?

Mike:

The old way to do it is OK as others have said. I might be inclined to swap Bob Duckworth for one of his transformers. These circuits usually run around 200 Hz and use a tape wound toroid. They are self excited oscillators.

A tape wound toroid is made by taking a very long piece of narrow, thin sheet steel and winding it like a flat spring into a toroid. The toroid is then encapsulated in plastic of some sort. The toroid is basically a normal power line transformer type core except it is toroid shaped.

These circuits have *NO* regulation. They basically convert the incoming voltage to a 50% duty cycle rectangular wave and use the winding ratio to step up the voltage. If the input voltage drops, the output voltage drops.

There are any number of circuits made by Maxim, Unitrode, Motorola, and just about every other semiconductor manufacturer that will provide for regulated DC-DC converters. These are basically the same thing as the classic circuit except they use a master oscillator and circuitry that varies the duty cycle to regulate the voltage out. These also tend to run in the supersonic range so the whine problems of the classic circuits are less. The size of the transformer is less

also. A transformer for a 50KHz converter at 200 Watts will weigh less than a pound and fit in the palm of your hand.

You can make a more modern version of the classic circuit by making a 50 KHz oscillator that drives a couple of IRF510 FET's in push-pull driving a transformer wound on a mix 26 toroid or on a 3B5 pot core. Again, remember that you won't have any regulation in this situation. The regulation is probably not a problem for a firebottle rig.

Ray Mack
WD5IFS
mack@mails.imed.com
Friendswood (Houston), TX

Reply Separator

Subject: Using switching PS to get B+ from 12v -- ideas?

Author: mjsilva@ix.netcom.com (michael silva) at mails

Date: 5/30/97 11:22 AM

Hi all,

I'm very interested in putting together a (semi) portable rig (current plans are three 5EA8s (sic) for receiver, 6EA8 and 6AQ5 for transmitter), and I'm thinking about how to get 300 or so volts out of a car battery. I know the old way to do it, but does anybody know enough about switching regulators to comment on the difficulty of doing it that way? Any parts or manufacturers recommendations?

Date: Fri, 30 May 1997 18:39:28 +0000

From: "Brian Carling, Radio AF4K" <bry@mnsinc.com>

Subject: Re: Using switching PS to get B+ from 12v -- ideas?

Bob & Mike - caution when using SWITCHING POWER SUPPLIES!
Some of them REALLY do cause a LOT of hash in the receiver!

The Lambda ones that I tried some years ago did, anyway!

ZUT! - Bry

On 30 May 97 at 14:15, BOB DUCKWORTH spoke about Re: Using switching PS to get B+ fr and said:

> Junkbox swap time!
> I've about a dozen Triad inverter transformers.
> Complete with apps sheet or look in 67 handbook
> at the mobile transceiver construction article.
> 600VDC and 300VDC (centertapped secondary) at 120mil total.
> Two transistors, some diodes and caps, two bias resistors
> and your set.
> Don't know about switching other than it's like an
> inverter with an autotransformer and some feedback
> to vary pulse width as needed to maintain power at
> voltage or current set point.

> -bob
>
>
> michael silva wrote:
> >
> > Hi all,
> >
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> >
> > 73,
> > Mike, KK6GM
>

*** 73 from Radio AF4K/G3XLQ Gaithersburg, MD USA *
** E-mail to: bry@mnsinc.com *
*** See the interesting ham radio resources at: *
** <http://www.mnsinc.com/bry/> *

Date: Fri, 30 May 1997 18:39:29 +0000
From: "Brian Carling, Radio AF4K" <bry@mnsinc.com>
Subject: Re: Can I do anything with these?

Adam, you can use ALL of those tubes in a transmitter!
None of them will get you above the QRP 5 watt "full gallon" level
though! There are some excellent designs out for transmitters using
the 6U8.

6CL6 is a common driver or VFO tube used in small xmtrs too!

73 - Bry, AF4K

On 30 May 97 at 13:00, Adam Liette spoke about Can I do anything with
these? and said:

> 12AX7

*** 73 from Radio AF4K/G3XLQ Gaithersburg, MD USA *
** E-mail to: bry@mnsinc.com *
*** See the interesting ham radio resources at: *
** <http://www.mnsinc.com/bry/> *

Date: Fri, 30 May 1997 16:15:48 -0700
From: "A Redshirt" <occupant@ns.net>
Subject: On switching P.S. to get B+ from 12VDC...

Folks:

As I threw away about fifteen G.E. MASTR PRO mobile power supplies last month, I thought "I bet SOMEBODY...."

Anyway, these things power the last of the tube-final type commercial FM two way stuff that Generous Eccentric produced. The torroid xfmr is about as big around as a Coke can; maybe 1 1/2' tall, and the unit would cause tubes like 5894s and 8072s to pound out up to one hundred watts (with two transformers; the single xfmr supply was good for 25-40 watts out the hole). Remember that this is ICAS rating.

These power supplies ought to be available at most junk meets...er, Swap Fests for about \$0.05 a pound. Two Phillips head screws, one connector, and the jewel is in your hand. Torroid, xsistors, filter caps, everything one needs for the ideal B.A. mobile! One piece. Heat sink built in. Standard made-in-USA parts used throughout. Designed for PTT operation. Stack those Torroids, grab that 807, and kick some 'phone BUTT while mobile!!

See also your local VHF/UHF FM types. Say "GE MASTR PRO mobile supplies wanted!", and stand back. There were literally *millions* of these things produced, and they would be excellent for the mobile B.A. amateur.... And the FM guys will never realize what the resolute B.A.-type can accomplish with something like this that has little value to them...

(I have specs, pinouts, blah blah blah, if there is sufficient interest...)

de John
occupant@ns.net

Date: Fri, 30 May 1997 16:32:28 -0700 (PDT)

From: Ken Gordon <keng@uidaho.edu>

Subject: Re: Can I do anything with these?

>

> I have the following tubes. Can I use any in a transmitter?

>

> 6BH6

Sharp cutoff pentode. Could probably use this one as very low power transmitter. Plate resistance is 1.4 meg. Should make a decent crystal oscillator or VFO tube. Suppressor is separate from cathode.

> 6U8A

9 pin miniature. Medium mu triode and sharp cutoff pentode. Would make a good triode oscillator with following pentode amp. Low power. About 2.5 watts in class A. More in class C.

> 12AU7A

Medium mu dual triode. Could be used as a low power transmitter.

> 6CL6

Pentode. Pretty decent power for its size, about 3 watts. Used as driver in many small transmitters.

> 12AT7/ECC81

High mu dual triode. Pretty small but would make a pretty good VFO/Cathode follower.

> 12AX7

High mu dual triode. Could run 7.5 watts as class B push-pull amp. if you push it a bit.

Hope this is what you are looking for.

Ken W7EKB

Date: Fri, 30 May 1997 20:06:39 -0700 (MST)
From: Chris Trask <ctrask@primenet.com>
Subject: Re: Can I do anything with these?

On Fri, 30 May 1997, Ken Gordon wrote:

>

> I have the following tubes. Can I use any in a transmitter?

>

> 6BH6

> 6U8A

> 12AU7A

> 6CL6

> 12AT7/ECC81

> 12AX7

>

Actually, I can see a complete QRP transceiver here, with a buffered crystal oscillator in the transmitter and a rather nice regen or direct conversion receiver.

I gotta go.

Regards,

Chris

/ If you understand it, \
/ then it's obsolete! \
\
|_____|
oo\
(__)\

Circuit Design for the
RF Impaired

Chris Trask / N7ZWY
Principal Engineer



ATG Design Services
P.O. Box 25240
Tempe, Arizona 85285-5240

Email: ctrask@primenet.com

Graphics by Loek Frederiks

End of glowbugs V1 #46

%%%% GlowBugs %%%% GlowBugs %%%% GlowBugs %%%% GlowBugs %%%%

[AB4EL Ham Radio Homepage @ SunSITE](#)

Created by **Steve Modena, AB4EL**
Comments and suggestions to modena@SunSITE.unc.edu
